pupil opening, the lens has the property of simultaneous vision multi-focal effect with the capability of correcting for the astigmatism. In cases of greater astigmatism (greater than the variation of the lens power can correct), the anterior surface may be made toric by conventional means used to correct astigmatism of any monovision contact lens. In a multi-focal toric lens, the equi-power contours will not be concentric circles as shown in FIG. 1, but they will be concentric ellipses.

Accordingly, a soft contact lens wherein the aspheric properties are concentrated in the center portion in the lens in a region generally less than the normal pupil opening provides a lens having simultaneously multi-focal properties. By providing the desired distance vision power at the center region and the power increases in an aspheric region having gradually varying optical power within the normal opening of the pupil, some part of the lens near the central portion will form a sharp image of a distant object on the retina and another part of the lens in the peripheral part will form a sharp image of near by object. Even though the center portion of the lens forms a blurred image of the near-by object, as long as there is a sharp image of the object of the retina simultaneously, the human brain selectively picks up the sharp image of the desired object. Thus, a lens suitable for far vision, intermediate vision and near vision is readily provided in accordance with the invention. Elliptical bands within the pupil opening permit forming a sharp image by an eye with astigmatism. The continuously variable multi-focal contact lenses may be prepared by distorting the lens blank in a predetermined manner and forming spherical surfaces in the distorted blank to yield the aspheric region within the normal pupil opening.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above process and in the article set forth without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which as a matter of language might be said to fall therebetween.

What is claimed is:

1. A continuously variable multifocal soft contact lens suitable for creating sharp images of far objects, intermediate objects and near objects simultaneously on the retina of a wearer, comprising:

a lens body having a concave surface and a convex surface, said lens having a central optical zone with continuously varying optical power from essentially the optical center point of the lens with the desired distance vision power at the center region of the optical zone and continuously increasing to the desired near vision power within a region having a dimension less than the maximum pupil opening of the wearer in the dark, the optical power of the lens increasing from the optical center point at a rate so as not to create a predominant far vision image.

2. The contact lens of claim **1** wherein the continuously varying optical power increases 3 to 5 diopters.

3. The contact lens of claim **1**, wherein the diameter of the region of the continuously varying optical power is about 5.4 to 6.7 mm after expansion.

4. The contact lens of claim **1**, wherein the concave surface of the lens is aspheric.

5. The contact lens of claim **4**, wherein the remaining surface in the optical zone is one of aspheric, spheric or toric.

6. The contact lens of claim **4**, wherein the remaining surface in the optical zone is spheric.

7. The contact lens of claim **6**, wherein the diameter of the region of the continuously varying optical power is between about 5.4 mm and 6.7 mm after expansion.

8. The contact lens of claim **7**, wherein the concave surface outside the region of the continuously varying optical power gradient is essentially spherical.

9. The contact lens of claim **7**, wherein the power of the lens at the center when worn is in accordance with the formula:

$$P_w = \frac{1}{\frac{r_1 \times \text{Exp}}{n-1} - \frac{t \times \text{Exp}}{n}} - \frac{n-1}{r_2' \times \text{Exp}}$$

wherein the radius of curvature at the center of the concave aspheric surface is designated r_2', t is the thickness of the lens at the center, the radius of the anterior surface of the optical zone is r_1, Exp is the expansion factor for the lens material and n is the index of refraction of the lens when worn, all other dimensions in the state before expansion.

10. The contact lens of claim **9**, wherein the thickness of the lens at the center is no less than about 0.04 mm.

11. The contact lens of claim **9**, wherein the minimum thickness of the junction between the optical zone and the spheric concave surface is about 0.07 mm.

12. The contact lens of claim **9**, wherein the diameter of the optical zone is about 8 mm.

13. The contact lens of claim **9**, wherein the diameter of the lens is about 12.15 mm.

14. The contact lens of claim **1**, wherein the lens is formed of a HEMA polymer.

15. The contact lens of claim **1**, wherein the continuously varying optical power has complete rotational symmetry.

16. The contact lens of claim **1**, wherein the continuously varying optical power is adapted to provide at least one non-circular band within the pupil opening to correct for astigmatism.

17. The contact lens of claim **1** formed by squeezing a lens blank by contacting a first surface with ball means having a spherical surface of radius R to deflect the opposed surface of the lens blank, cutting and polishing the opposed surface to a desired concave spherical shape, controlling the squeezing by the amount of deflection of the lens blank and the radius R of the ball means so that upon release of the lens blank, a lens button having an aspheric concave surface with varying radius of curvature at least within a dimension less than the maximum pupil opening of a wearer is formed and finishing the first surface to form a convex surface of the lens to yield when wet and expanded a contact lens having continuously variable optical power with the desired distance vision power at the center region of the lens and increasing to the desired near vision power within the dimension of the maximum pupil opening.

18. The contact lens of claim **1**, formed by molding.

19. The contact lens of claim **1**, formed by casting.